Secure Multimodal Biometric Authentication Using Face, Palmprint and Ear: A Feature Level Fusion Approach

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Gayatri U. Bokade ; Rajendra.D. Kanphade All Authors

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Metadata

Abstract:

Widespread of biometric technology for identity management in many nations has given rise to new means for biometric research. Due to the cumulative requirement of higher security schemes, multiple biometrics are preferred over single biometric to generate most accurate authentication result. Involving multiple biometric traits comes up with challenges to combine the feature data by selecting proper level of fusion. This paper proposes reduced dimension feature vector concatenation method for three biometric traits like Face, Palmprint and Ear. The use of only one algorithm of Principal Component Analysis for feature extraction and Euclidean distance for final matching make the system robust by reducing the computational complexity. The resultant biometric template is also protected by using intermixing of feature vector scheme.

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Gayatri U. Bokade
Department of Electronics & Telecommunication, Dr. D. Y. Patil Institute of Technology, Pune, India

Rajendra.D. Kanphade
Department of Electronics & Telecommunication, Dr. D. Y. Patil Institute of Technology, Pune, India

Multimodal Biometric Authentication Based on Feature Level Fusion: A Novel Approach to Improve Genuine Acceptance Rate in Case of Accidental Injuries to Biometric Traits

Gayatri U Bokade and Rajendra D Kanphade***

Biometric identity has become an obligation in many nations across the globe. The cumulative requirement of higher security schemes has led to an astonishing interest in biometric-based person authentication system. Due to the limitations of single biometric system, the multimodal biometric user authentication is attracting the attention of researchers. In today's era where technology is growing at a rapid stride, still there are several person authentication-related issues that need to be fingered in daily. Even the best designed multimodal biometric system suffers from reduction in Genuine Acceptance Rate (GAR) in the event of user accidents like finger burning, surgeries, injuries, etc. The paper aims at improving the GAR when the biometric trait under consideration suffers from change in the user biometric due to accident. The paper uses binary large object detection method to find the changed and unchanged features and measures the similarity between it. Logistic regression method is used for final verification. The feature level fusion scheme gives very promising results for genuine authentication in both scenario of regular and injured biometric.

Keywords: Multimodal biometric authentication, Logistic regression, Binary large object detection, Feature level fusion

Introduction

The advancement of new technologies has provided new resources of authentication. Today, biometric technology is becoming most popular for authentication. Most of the developed and developing nations (Corbett, 2017) are using biometric data as the trusted means for user authentication. For example,

* Research Scholar, Dr. DY Patil Institute of Technology, Pimpri, Pune 411018, Maharashtra, India; and is the corresponding author. E-mail: gubokade@gmail.com

** Professor and Head of Department, Padmabhushan Vasantdada Patil Institute of Technology, Bavdhan, Pune 411021, Maharashtra, India. E-mail: kanphaderd2015@gmail.com

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Multivariate Analytic Technique for Forensic Human Identification based on Dual Cross Patterns of Hand Radiographs

Sagar V. Joshi, Rajendra D. Kanphade

Abstract: ***In recent times, the necessity for personal identification systems has increased due to several accidents. Under circumstances of human-made and natural disasters, it is not possible to employ a traditional biometric system. Hence, biometric radiographs of the skull, hands, and teeth are good replacement methods to identify victims. The fundamental intent of the research is to acquire a novel approach for identifying missing and anonymous individuals based on Dual Cross Pattern (DCP) features of hand radiographs. The suggested technique has contains two major steps: feature extraction and classification of the feature vectors. In this paper, an effort is made to find the most adequate classifier between the Classification Tree (CT), Feed forward Neural Network (FNN), Multiclass Support Vector Machine (m-SVM), and k-Nearest Neighbor (k-NN) based on the accuracy of retrieval of 10 adult subjects from the dataset of 300 right-hand radiographs. The classification results attained from simulation and discriminant analysis on a small primary database are encouraging.***

Keywords: Discriminant analysis, dual **cross grouping,** ***hand radiographs, pattern encoding.***

I. INTRODUCTION

Crime and disaster incidents in recent times have emphasized the importance of biometric radiographs to procure the attention of the public. In recent times, authentication and identification of a person have become essential parts of security systems. In the recent past, biometric identification was used mainly for a variety of applications, including smart cards, law enforcement, access control, information security, and forensics, due to their level of accuracy, reliability, and performance [1, 2].There are two types of biometric features, behavioral and physical. The first type covers only behavioral traits, which include the signature, gait, and voice. The second type covers human anatomical parts such as the retina, face, fingerprints, hand veins, hand geometry, and ear shape [3]. Traditional biometric techniques are not applicable to victims of natural disasters such as tsunami, earthquake, and others. In such cases, forensic radiography is useful to identify an unknown person. It is one of the forensic fields that involve recognizing people through post-mortem radiological images of different parts of the body including teeth, hand, skeleton, and skull. These radiological images of the dead body are compared with a missing person's ante-mortem reports to find out similarities. Radiographs acquired before and after death are termed as Antemortem (AM) and Post Mortem (PM) radiographs respectively [4]. Generating a biometric feature for victims using a computer has become a challenging research topic. Additionally, there are many traditional biometric features, fingerprints, face, and iris; however, there is no specific research to focus on hand radiographs. Therefore, in this paper, a computer-facilitated human identification technique based on hand radiographs of victims or deceased people through Dual Cross Patterns (DCP) texture features of is presented.

Identification of a person using hand biometric is not a new concept. Traces of such methods date back to the early 1970s and are comparatively older than palm print - a part of dactyloscopy. Human hand consists of sufficient anatomical characteristics through which a person can be identified; however, it does not include any particular mechanism to find a person. Numerous studies have investigated hand-based biometry in general perspective. Certain schemes directly depend on geometrical features whereas others are using the silhouette shape of hands [5, 6]. Some systems are developed using characteristics like finger width, palm and finger length, deviations of fingers, and angles with horizontal lines [7–10]. In general, these systems can be used to either measure or analyze the overall shape, structure, and thickness, length, and width. In some specific methods, the user must keep his hand in a decided predefined position [7, 11]. This gives additional information about problems regarding the users' health and hygiene [12]. Kumar et al. [13] have suggested a unified system using hand geometry features with hand-based verification. Some studies [6, 14-16] explained hand radiograph applications in different fields to examine the hand of an unknown or known person. Pietka [14] developed a computer- aided classification algorithm to help radiologists to examine the bones of pediatric patients. Pietka et al. [15] provided an examination of skeletal maturity through computer-assisted analysis conducted on a hand radiograph. Pietka et al. [16] clinically examined skeletal maturity. Garcia et al. [17] proposed active contours based algorithm for identification of hand bone contours. An automated system has been developed using the Tanner-Whitehouse (TW2) method by Neimeijer et al. [18]. Zelinski and Wojciechowski [19] discovered erosions and osteophytes and employed computer-based hand

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* Correspondence Author
Sagar V. Joshi*, Department of Electronics & Telecommunication, Dr. D. Y. Patil Institute of Technology, Pimpri, Pune, India.
Rajendra D. Kanphade, Department of Electronics & Telecommunication, Dr. D. Y. Patil Institute of Technology, Pimpri, Pune, India.

FALSE DATA INJECTION ATTACKS IN CYBER PHYSICAL NETWORK SYSTEM

Kiran B. Giri, Prof. Bhagyshri Warhade
Department of Electronics and Tele Communication Engineering
Nutan Maharashtra Institute of Engineering and Technology, Talegaon Dabhade,
Savitribai Phule Pune University, India.

Abstract : Wireless sensor networks (WSN) are expected to interact with the physical world at an unprecedented level to enable various new applications. However, a large-scale sensor network may be situated in a probably unpropitious or even hostile surroundings and potential threats can range from coincidental node failures to intended deface. Due to their relatively small sizes and disregarded operations, sensor nodes have a high risk of being encapsulated and compromised. False sensing reports can be injected through compromised nodes, which could conduct to not only false alarms but also the consumption of limited energy resource in a battery powered network.

I. Introduction

In Cyber-Physical Network Systems (CPNS), attackers could inject false measurements to the controller through compromised sensor nodes, which not just threaten the security of the system, additionally consumes system resources. To deal with this issue, various en-route filtering have been intended for wireless sensor networks. However, these schemes either need flexibility to the quantity of compromised nodes or rely on upon the statically arranged routes and node limitation, which are not suitable for CPNS.

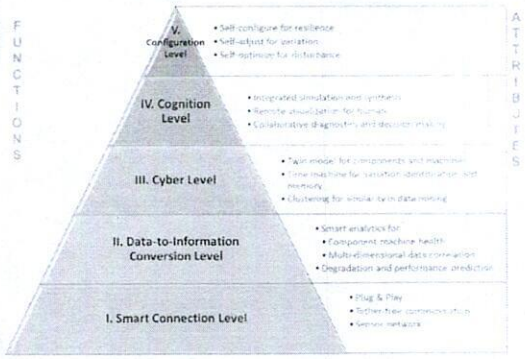

Fig 1 - Cyber physical network system

The false data insertion in a cyber physical network system can be overcome by the formation of clusters where the neighbor sensor node with exactly similar properties will be standardized into the form of clusters. In the hierarchical network structure each cluster has a leader, which is called cluster head (CH). The sensor nodes repeatedly transmit their data to the CH nodes. CH nodes compound the data and transmit them to the base station (BS). CH nodes transmit the data either directly or through the intermediate data transmission with other CH nodes. The BS is the data processing module for the data which is received from the sensor nodes. The Base Station is not variable it's fixed at a place in a stable manner which is up to a point from the all the sensor nodes. The function of each CH is to fulfill ordinary or common functions for all the nodes in each cluster, like collecting all the data before sending towards the BS. In other way, the CH is the sink node for the cluster nodes, and the BS is the sink for the CHs [1].

A cyber-physical system (CPS) is a mechanism that is controlled or monitored by computer-based algorithms, tightly integrated with the Internet and its users. In cyber-physical network systems, physical and software elements are extremely twisted, each working on inconsistent structural and secular scales [2]. The advantages of cluster based environment are: 1) Supporting network extensibility and decreasing energy consumption through data collection. 2) It can localize the route setup within the cluster and thus reduce the size of the routing table stored at the individual node.

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Theoretical & Computational Design of Wind Turbine with Wind Lens

Sumukh Kulkarni[1], Abhay Badhe[2], Prashant Kumbhar[3], Prem Panaval[4], Rohit Jadhao[5]

[1,2,3,4]UG Student, Department of Mechanical Engineering, PCET's NMIET, Talegaon Dabhade, Pune, Maharashtra, India
[5]Assistant Professor, Department of Mechanical Engineering, PCET's N.M.I.E.T, Talegaon Dabhade, Pune, Maharashtra, India

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Abstract - *The power generated in a wind turbine is directly proportional to the cube of the wind speed as per theory. As per Betz limit, only 59.3% of kinetic energy is converted into power output by using wind turbine. If more wind energy is concentrated over the turbine blade then an effective increase in power output can be achieved. Thus, in order to achieve this a wind diffuser can be utilized which creates a turbulence behind turbine blades which draws more air into the turbine. This diffuser can effectively increase the energy output by increasing the speed of the wind turbine. The objective of work is to increase the reliability of turbine blades by developing airfoil structure and also to achieve reduction in noise during operation of the turbine.*

Key Words: **Betz Limit, Turbine Blade, Wind Diffuser, Turbulence, Airfoil**

1. INTRODUCTION

For effective energy resource in the future, the limitation of fossil fuel is known and security of alternative sources of energy has become important. Also due to environmental issues like global warming the development of alternative source of energy is imminent. Wind energy technologies are developing rapidly and are set to play a major role in the energy field in the future. But comparing the overall demand for energy, the extent of wind power usage is relatively small. Wind power generation is proportional to the cube of wind speed. Therefore, a large increase in output is brought about if it is possible to create even a slight increase in the velocity of the approaching wind to a wind turbine. If we can increase the wind speed by utilizing the fluid dynamic nature around a structure or topography, namely if we can concentrate the wind energy locally, the power output of a wind turbine can be increased substantially. The diffuser creates a lower air pressure zone directly behind the blades, so as we know air will tend to move towards equilibrium the high-pressure air in the frontal side of the turbine will accelerate in to the low-pressure area at the caudal end of the turbine. It is also known and accepted that no turbine can produce a sustained and viable electric current at speeds below 10 mph. The wind lens creates an area of lower pressure behind the turbine thereby inducing a suction of wind through the turbine which increases the effective wind speed.

1.1 Working of Wind Turbine

Kinetic energy of moving air due to motion is utilized for the working of the wind turbine. When wind blows past the turbine blades., energy conservation takes place due to profile of the blades and the rotor rotates capturing the kinetic energy of the wind. Energy conversion from kinetic to mechanical energy takes place due to rotation of the blades. The blades are coupled to the rotor shaft and the shaft is further coupled to a step-up gearbox. The part of the turbine behind the blades which consist of the gearbox and generator is termed as Nacelle. The mechanical energy is converted into electrical energy by a generator giving power output. The nacelle is also equipped with wind vanes and anemometer. The anemometer is a wind speed measuring device and its main function is to measure high velocities i.e. greater than 10 m/sec. when the wind velocity is high the gearbox is cut off from the turbine to avoid any mechanical damages. Wind vanes are used to sense the change in the wind direction.

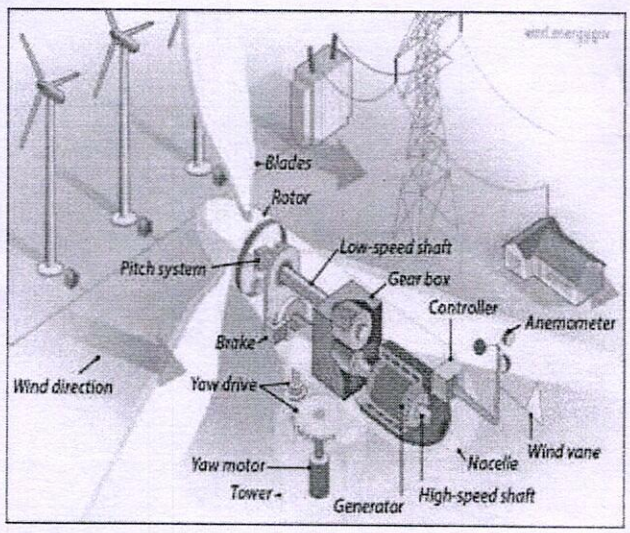

Fig-1: Working of a wind turbine

1.2 Wind Lens Turbine

Wind lens turbine is newly developed system which adopts a diffuser shaped structure along with a large flange attached at the exit of the shroud. Due to a strong vortex formation at the end of the flange, a huge amount of flow of mass can be drawn in to the turbine. Thus, this new system can exceed the Betz limit. Due to this the power developed by the turbine can be increased to a relatively greater amount.

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Differentiate Theoretical and Computational Performance of Oval Shape Fin with Different Geometry

Shubham S. Nikam[1], Rushikesh G. Pachpute[2], Yogesh B. Dhamankar[3], Sikandar S. Karke[4], Prof.Rohit R. Jadhao[5]

[1,2,3,4]Student, Mechanical Engineering Department PCET's N.M.I.E.T, Talegoan Dabhade, Pune (MH), India
[5]Assistant Professor, Mechanical Engineering Department PCET's N.M.I.E.T, Talegoan Dabhade, Pune (MH), India

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Abstract - *Fins are important part of engine mostly used for transfer cooled and effective air for cooling of IC engine. The main purpose of using these cooling fins is to cool the engine cylinder by air. Normally rectangular fins are used in these work we are changing rectangular shape fin to oval shape. Fins are subjected to high temperature variations and thermal stresses. By doing thermal analysis on the engine cylinder fins, it is helpful to know the heat dissipation inside the cylinder. Aim of these project is to increase the heat dissipation rate by increasing the surface area. The fin materials used in this analysis are: Aluminum alloy 204 the modification was done in size as well as geometry*

***Key Words*:-Engine Cylinder Fins, Thermal Analysis, ANSYS, SOLID EDGE, Heat Flux**

1. INTRODUCTION

Fins are extended surfaces designed to increase the heat transfer rate of the body by increasing the convective surface area. Mainly transfer cooled and effective air to engine & maintain uniform temperature. Fins are use by increase heat transfer rate; improve fin efficiency & cooling capacity and avoid failure. An air cooled motorbike engine dissipates waste heat from the cylinder through the cooling fins to the cooling air flow created by the relative motion of moving motorbikes. A fin are used to cool engine by increasing convection. In cylinder only 25-30% of power that are produce are useful about 70% of power is loss ,it should be necessary to remove waste heat from cylinder block. If it is not remove it causes damage to cylinder and piston. Shape of cylinder block, piston is change. To prevent the parts from damage fins are used. To prevent from damage Engine have cooling mechanism in engine to remove this heat from the engine. In some bikes water-cooling system and almost all two wheelers uses Air cooled engines, because Air-cooled engines have more advantages like lighter weight and lesser space requirement.

1.1 Problem Statement

It is seen that the quantity of heat given to the cylinder walls is considerable and if this heat is not removed from the cylinders it would result in the prigniation of the charge. In addition, the lubricant would also burn away, thereby causing the seizing of the piston. Change the shape of block and piston Excess heating will also damage the cylinder material

1.2 Objectives

- In this present work thermal analysis of Honda splendor bike fins and it valid with theoretical result
- Thermal analysis and mathematically evaluation of modified existing fins dimensions
- To determine the type of geometry and its dimensions for optimum heat transfer rate.

1.3 Methodology

- 2 D drawing of Exiting fins
- 3 D Modeling of Exiting fins on SOLID EDGE ST9
- Theoretical Calculation of fins
- Thermal Analysis of fins on analytical software(ANSYS)

1.4LiteratureReview

In this chapter, reviews various studies carried out in the field fins and their analysis,

RashinNath.KK, (2017) et al. The heat transfer rate increases for zigzag and wavy fin compared to that of conventional flat fin. By changing the fin geometry from the convention flat fin the heat transfer rate can be improved greatly, which leading to less thermal stress development. Zigzag and wavy fin thus can be preferred over conventional fins

B N Niroop Kumar Gowd (2014) concluded that the shape of the fin can be modified to improve the heat transfer rate and can be analyzed. The thickness of the original model is 3mm, reduced to 2.5mm.

By reducing the thickness of the fins, three other materials are considered which have more thermal conductivities than Aluminum Alloy 204. By observing the thermal analysis results, thermal flux is more for Beryllium than other materials.

Experimental Validation of Computational Design of Wind Turbine with Wind Lens

Sumukh Kulkarni[#1], Abhay Badhe[#2], Prashant Kumbhar[#3], Prem Panaval[#4], Rohit Jadhao[#5]

[#,1,2,3,4]*UG Student, Department of Mechanical Engineering, PCET's NMIET, Talegaon Dabhade, Pune, Maharashtra, India*

[#5]*Assistant Professor, Department of Mechanical Engineering, PCET's NMIET, Talegaon Dabhade, Pune, Maharashtra, India*

Abstract

The power generated in a wind turbine is directly proportional to the cube of the wind speed as per theory. As per Betz limit, only 59.3% of kinetic energy is converted into power output by using wind turbine. The objective of work is to increase the reliability of turbine blades by developing air foil structure and also to achieve reduction in noise during operation of the turbine. Thus, in order to achieve this a wind diffuser can be utilized which creates a turbulence behind turbine blades which draws more air into the turbine. This diffuser can effectively increase the energy output by increasing the speed of the wind turbine. If more wind energy is concentrated over the turbine blade then an effective increase in power output can be achieved.

Keywords — *Wind turbine blades, Aerofoil, Wind Diffuser.*

I. INTRODUCTION

For the application of an effective energy resource in the future, the limitation of fossil fuels is clear and the security of alternative energy sources is an important subject. Furthermore, due to concerns for environmental issues, i.e., global warming, etc., the development and application of renewable and clean new energy are strongly expected. Among others, wind energy technologies have developed rapidly and are about to play a big role in a new energy field. However, in comparison with the overall demand for energy, the scale of wind power usage is still small; especially, the level of development in Japan is extremely small. As for the reasons, various causes are conceivable. For example, the limited local area suitable for wind power plants, the complex terrain compared to that in European or North American countries and the turbulent nature of the local wind are pointed out. Wind power generation is proportional to the wind speed cubed. Therefore, a large increase in output is brought about if it is possible to create even a slight increase in the velocity of the approaching wind to a wind turbine. If we can increase the wind speed by utilizing the fluid dynamic nature around a structure or topography, namely if we can concentrate the wind energy locally, the power output of a wind turbine can be increased substantially. This creates a lower air pressure within the area directly behind the blades. Because air will tend to move toward equilibrium, the high-pressure air in front of the blades will necessarily accelerates into the low-pressure area the wind lens working at lower wind speeds than traditional turbines.

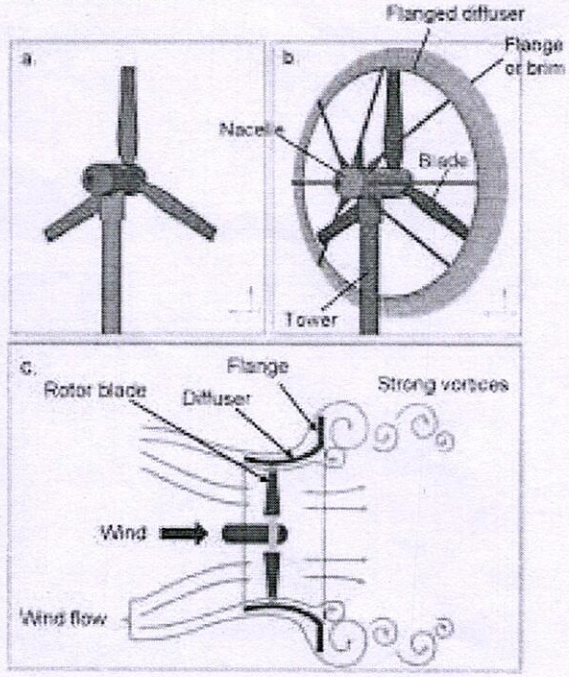

Fig 1: Wind Turbine with Wind Lens

II. WORKING OF WIND TURBINE

Kinetic energy of moving air due to motion is utilized for the working of the wind turbine. When wind blows past the turbine blades., energy conservation takes place due to profile of the blades and the rotor rotates capturing the kinetic energy of the wind. Energy conversion from kinetic to mechanical energy takes place due to rotation of the blades. The blades are coupled to the rotor shaft and the shaft is further coupled to a step-up gearbox. The part of the turbine behind the blades which consist of the gearbox and generator is termed as Nacelle. The mechanical energy is converted into electrical energy by a generator giving power output. The nacelle is also equipped with wind vanes and anemometer. The

Invisible Video Watermarking for Data Integrity and Security based on Discrete Wavelet Transform – A Review

Mr. Nitin A. Dhawas
Nutan Maharashtra Institute of Engineering & Technology
Talegaon, Dabhade (MS) India
dhawasnitin2010@gmail.com

Dr. Sambhaji A. Patil
Dattakala College of Engineering
Dattakala Shikshan Sanstha,
Swami-Chincholi, Tal-Daund, Dist-Pune (MS) India
sapatil.mah@gmail.com

Abstract— To maintain the data integrity of transmitted video is very essential to secure any web-based system. Implementation of the invisible video watermarking is the best solution by using discrete wavelet transform gives us secured transformation in image processing applications. This method is also implemented as a 2-factor authentication (2FA) to secure the system. To protect the piracy of important data we implemented the above method.

The major issue of illegal manipulation and sending/receiving of digital video becomes a big problem. To resolve this kind of issue, a latest and new technology has been suggested or we can say that proposed. Basically, it is a mechanism of implant copyrights information into a bit streams of any kind of video, the video may be any type i.e. it will be study purposed, presentation purposed, organization purposed and entertainment purposed. In this kind of scheme, the random segmentation and reconstruction of implants secrete data is done without having or knowing the original provider video. Throughout this process, confidential data or sensitive data is implanted in separate video frames using the DWT's frequency territory. DWT means Discrete Wavelet Transform. In the DWT's i.e. discrete wavelet transforms video watermark mechanism has been inaugurated for securing the confidential or sensitive data. We proposed a Haar wavelet ground (based) digital watermark mechanism to secure confidential or sensitive data.

Keywords: Digital Video, DWT, Discrete Wavelet Transform; Principal Component Analysis.

I. INTRODUCTION

Watermarking is a technique for securing various copyright data such as text, image, audio, and video. Copyright protection is the major part of the watermarking. Since the 13th century, Digital Watermarking came into existence [1]. In case visible watermarks, visual patterns like logos were used to get inserted into digital data. To convey the hidden information, most watermarking systems involve marking alteration on the cover data. This technique is known to be invisible watermarks. Digital watermarks are found with the advancement of the internet. Thus, the thinking and way of the idea of watermarking into digital data can be naturally extended. Due to the escalation of digital data it may be an image, audio, and video, the popularity of digital watermarking has been increased. Recently the copyright of digital images and to verify the multimedia data integrity, numerous digital watermarking algorithms are developed [2][3]. Mainly due to the superior energy compaction property of wavelets, the use of the wavelets in the image and video coding has increased significantly over the years. The less need for a watermark is being invisible. Many authors require a watermark image to have the same quality as the original one; this has been found after studying several research papers. A number of properties of wavelet transform will be discussed in the next section. In one of the research, they proposed a novel watermarking method to embed QR codes in digital images. The mechanism is root or we can say that based on Discrete Wavelet Transform i.e. DWT.

The very fast expansion of the Internet in the last few years has fast increased the availability of digital data like audio, images, and videos to the public. The main goal of robust watermarking of the video is to implant information data within the video with a senseless form for the human understanding scenario but in a way that protects from attacks such as common video processing operations. The main approach is to produce an image/video that looks the same as the same to a human eye but still allows its positive identification in comparison with the owner's key if necessary. In fact any images or video watermarking technique can be extended to watermarking videos, but in reality video watermarking techniques need to meet other challenges like video coding technologies, large size of data, unseen watermarking detection, the unbalance between the motion and motionless region, some attacks like frame averaging, frame swapping, statistical analysis and other real-time features than that in image watermarking scheme. To be effective, the watermark should possess properties such as

Robustness: The watermark should be impossible to remove even if the algorithmic principle of the watermarking method is public.

Unambiguous: The retrieved watermark should uniquely identify the copyright owner of the content, or in case of fingerprinting applications, the authorized recipient of the content.

Loyalty: A watermark has a high reliability if the degradation it causes is very difficult to perceive for the viewer.

Computational Cost: Embedding and extraction of the watermark from the video both should be fairly fast and should have low computational complexity

Interoperability: Watermark system must be interoperable for the compressed and decompressed operations.